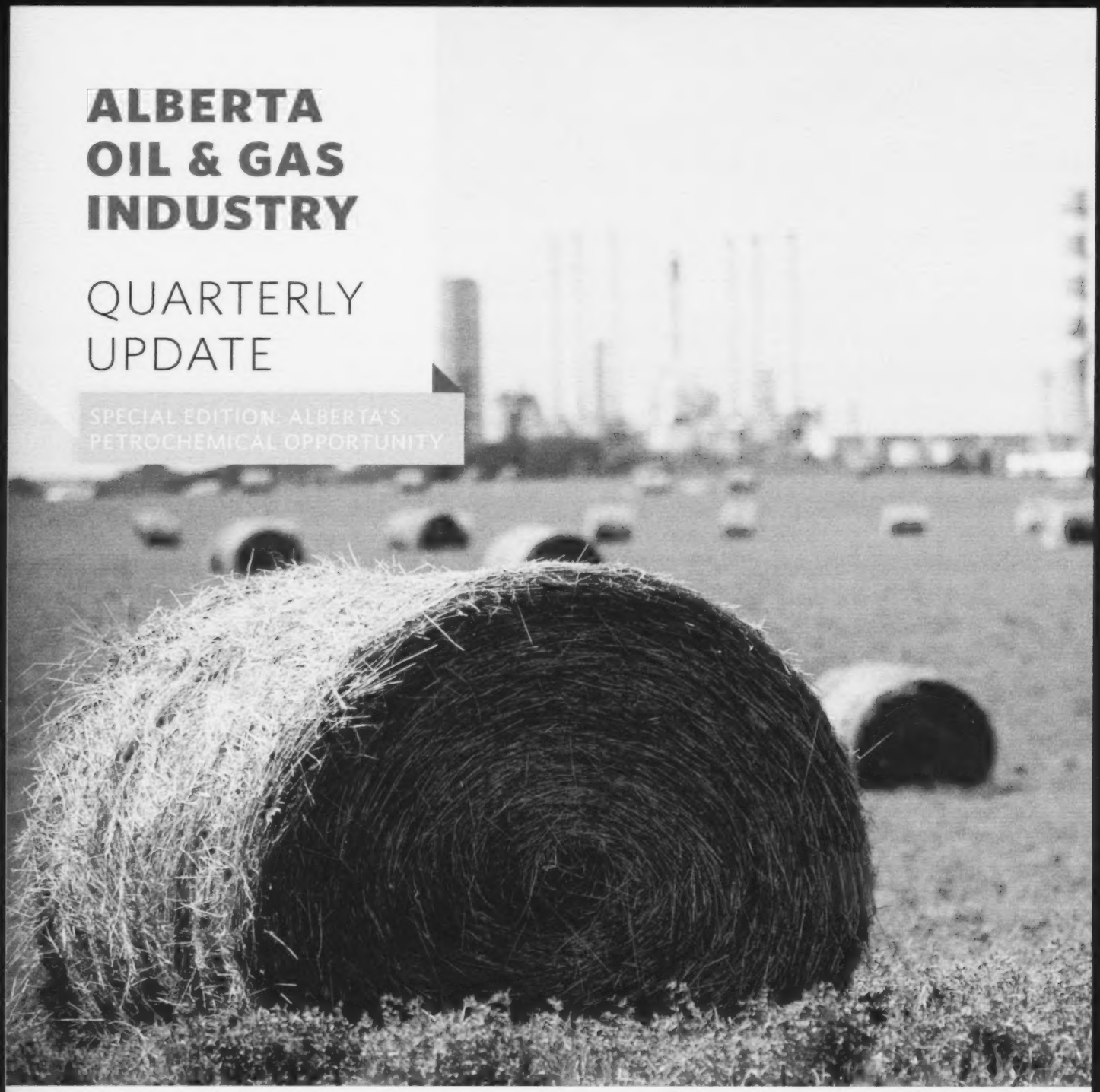
ALBERTA OIL & GAS INDUSTRY

QUARTERLY UPDATE

SPECIAL EDITION: ALBERTA'S PETROCHEMICAL OPPORTUNITY



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Message from the Honourable Deron Bilous

On behalf of Premier Rachel Notley and the Government of Alberta, I am happy to share a special petrochemicals edition of Alberta's Oil and Gas Quarterly.

Alberta is a western Canadian province home to a young, skilled workforce, forward-thinking industries and a competitive business environment. Our province has attracted Fortune 500 companies, global energy leaders and innovative start-ups looking for the best return on their investment.

Alberta is also Canada's largest petrochemicals centre. Our province holds many investment opportunities, particularly in Alberta's Industrial Heartland, home to Canada's largest concentration of petroleum refining, petrochemical, chemical processing and fertilizer production facilities.

Our government is committed to seeing Alberta's petrochemicals sector succeed. A priority of ours has always been to work with our partners to build on the strengths of our resource sector, and the province's leadership in petrochemicals is a vital part of achieving our plan to build a diversified economy for the future.

We launched the Petrochemicals Diversification Program (PDP) in 2016 to demonstrate continued commitment to supporting this growing sector. By supporting the construction of two world-scale petrochemical facilities, the PDP is taking advantage of Alberta's large supply of natural gas and the growing global demand for higher value methane and propane-derived products.

This session, our government is proposing Bill 1: the Energy Diversification Act. If passed, this bill would launch a second round of the PDP and establish a Feedstock Infrastructure Initiative. The bill would also initiate a Partial Upgrading Program, reflecting our response to the recommendations from our Energy Diversification Advisory Committee. This bill is about building on Alberta's existing strengths, investing in the future of our petrochemicals sector and demonstrating our government's next steps toward energy diversification.

I trust this publication will offer more insight into the many investment opportunities Alberta's diverse petrochemicals sector has to offer. I encourage you to reach out to the Alberta Economic Development and Trade contacts in this publication to explore how we can realize your business goals together.

Know that when you invest in Alberta, your business will have access to the support you need to get the job done, no matter what the challenge.

Hon. Deron Bilous
Minister of Economic Development and Trade
Government of Alberta

ALBERTA'S ENERGY OPPORTUNITY

As the world's population expands, demand for plastic grows and with it, the insatiable demand for petrochemicals to produce plastics.

This offers an unparalleled opportunity for Alberta to utilize its burgeoning supply of natural gas and, more specifically, natural gas liquids (NGLs), to produce value-added products in Alberta to meet growing global demand.

For investors, Alberta offers world scale hydrocarbon resource endowments - several hundred years of crude oil, natural gas, and NGL supply at current production rates. Recent upstream activity has been focused on the prolific liquids-rich gas plays in the Montney, Duvernay and Deep Basin, which has led to growing interest in the development of petrochemical facilities which can utilize Alberta's large and growing surplus of low cost petrochemical feedstocks.

The in-ground resources are supported by high-quality extraction and transportation infrastructure, with new infrastructure under development. Companies such as Pembina Pipeline, Keyera, TransCanada and Seven Generations are all working on projects that will expand the province's midstream infrastructure to accommodate increased gas and NGL production.

Federal and provincial governments support investment to capture value added opportunities, as evidenced by Alberta's recent announcement of a second round of the $500 million royalty credit Petrochemical Diversification Program (PDP), and the $500 million Petrochemical Feedstock Infrastructure Program (PFIP) which will provide tangible support to investors making long-term commitments in Alberta.

Alberta's highly skilled workforce and competitive construction costs lead to successful project development and implementation. With a strong, stable regulatory framework, and a competitive tax structure, project risk is mitigated and the long-term prospect for business in Alberta is very positive. ■

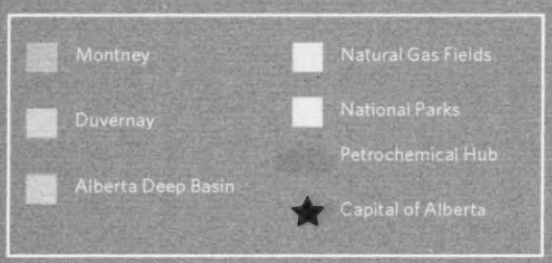
AS THE WORLD'S POPULATION EXPANDS, DEMAND FOR PLASTIC GROWS AND WITH IT, THE INSATIABLE DEMAND FOR PETROCHEMICALS TO PRODUCE PLASTICS.

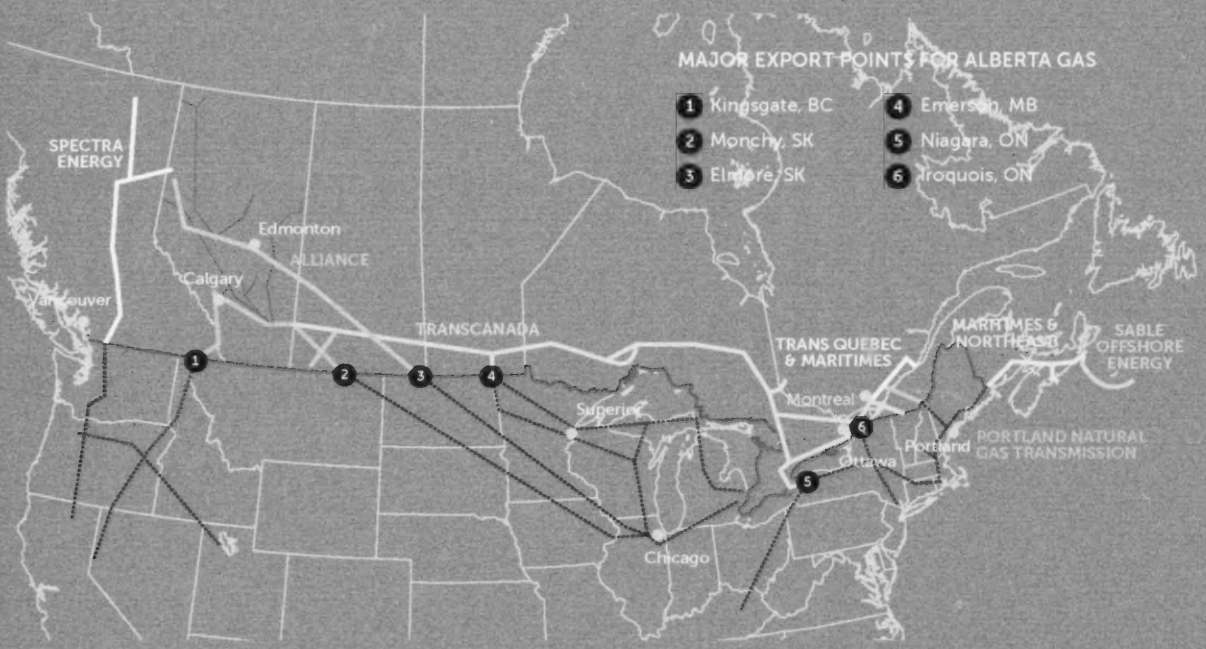
THIS OFFERS AN UNPARALLELED OPPORTUNITY FOR ALBERTA TO UTILIZE ITS BURGEONING SUPPLY OF NATURAL GAS AND, MORE SPECIFICALLY, NATURAL GAS LIQUIDS (NGLs), TO PRODUCE VALUE-ADDED PRODUCTS IN ALBERTA TO MEET GROWING GLOBAL DEMAND.

NATURAL GAS IN ALBERTA

While the majority of the province's natural gas is still produced from conventional sources, the potential to grow natural gas volumes from coal, shale and tight formations will also be strong contributors going forward.

Alberta has a large natural gas resource base, with remaining established reserves of about 33 tcf and an estimated potential of up to 500 tcf of natural gas from the coalbed methane resource. In addition, a large-scale resource assessment of shale gas potential in Alberta is underway and could significantly add to the natural gas prospects for the province.





UPSTREAM: RICH IN LIQUIDS

Montney, Duvernay, Deep Basin. Producers in Alberta are increasingly targeting production of natural gas liquids (NGLs), and there's a simple reason why: the economics just make sense.

Unlike dry natural gas, which is currently experiencing depressed pricing, NGLs in Alberta realize prices on par with the improving light oil benchmark West Texas Intermediate.

"The liquids make the money here," IHS Markit geoscience advisor Michael Muirhead recently told the Daily Oil Bulletin, commenting on production from the Duvernay play in west-central Alberta.

Indeed, while new growth has slowed dramatically in Alberta's oil sands, development of NGLs is helping drive a resurgence of activity in the conventional oil and gas sector. As a result, conventional investment is set to overtake oil sands.

In 2017, conventional investment is estimated to have increased by almost 60 per cent as producers responded to higher oil prices by increasing drilling. Despite low natural gas prices, Alberta liquids-rich plays remain competitive compared with other areas in North America because of low drilling costs and proximity to the condensate market.

"Increased interest in conventional oil and gas activity, particularly in the expanding Montney and Duvernay plays, resulted in $505 million worth of Crown land sales in 2017, more than triple 2016 sales," the Government of Alberta said in its 2018 budget.

"Rising prices for condensate and light oil will support conventional oil and gas investment, which is forecast to expand nearly six per cent this year."

Total Alberta NGL production increased by an estimated 3.7 per cent in 2017 as companies focused on liquids-rich development, according to the Alberta Energy Regulator (AER).

Drilling forecasts suggest that it will increase again in 2018. The Petroleum Services Association of Canada (PSAC) expects that 3,807 wells will be drilled in Alberta this year, up from last year's forecast of 3,604 wells, in part based on increasing interest in NGLs.

"For 2018, confidence that oil will stay in the low-to-mid US$50 range as markets tighten and inventories reduce, along with growing interest in Canada's vast liquids rich natural gas, should support a 4 - 5 per cent increase in activity levels," former PSAC president Mark Salkheld said in early January.

According to the latest data from the AER, the province has reserves of 564 million barrels of ethane, 335 million barrels of propane, 185 million barrels of butane, and 221 million barrels of pentanes plus.

PETROCHEMICAL CONNECTION

Montney NGL producer Seven Generations Energy recently made the connection from the drill bit to plastic products with the announcement it will supply propane to a new petrochemical plant being built in Alberta's Industrial Heartland.

Seven Generations, which produced 115,100 bbls/d of liquids in the fourth quarter of 2017, has reached an agreement to feed Inter Pipeline Ltd.'s new Heartland Petrochemical Complex, which will be operational in late 2021.

Inter Pipeline received $200 million in royalty credits for the $3.5-billion facility from the Province of Alberta through the first round of its Petrochemicals Diversification Program in 2016.

Major natural gas liquids producers in the Western Canada Sedimentary Basin:

- Seven Generations Energy
- Tourmaline Oil
- Paramount Resources
- Encana
- Peyto Exploration & Development
- Bonavista Energy
- Canadian Natural Resources
- Birchcliff Resources

Seven Generations says the deal is part of its strategy to find new markets for its products and realize higher returns.

"This sales agreement will enable 7G to diversify its propane sales and capture stronger realized prices within the Alberta petrochemical value chain," the company said in its annual results. ■

MIDSTREAM: INFRASTRUCTURE INVESTMENT BOOSTS FEEDSTOCK CERTAINTY

Photo: Keyera

Alberta is already home to a vast network of processing facilities and pipelines that take resources from the Western Canada Sedimentary Basin to market, either for export or for use in Alberta's Industrial Heartland.

More are on the way, as companies including Pembina Pipeline, Keyera, SemCAMS and Tidewater Midstream are working on projects that will expand the province's midstream infrastructure to accommodate increased liquids-rich production growth in plays like the Montney, Duvernay and Deep Basin.

However, lack of certainty of feedstock supply, particularly natural gas liquids (NGLs), has been raised as a concern for some downstream energy investors. The issue is most pressing for the ethane value chain.

Infrastructure is required to straddle pipelines and strip off the liquids from the natural gas flow. Existing straddle plants were built from the 1960s through the 1990s and are now underutilized because they are not located in the best areas of the province for today's natural gas flows.

The Alliance pipeline went into service in 2000, but no new straddle plants were built with it, so a significant amount of valuable NGLs are exported along with the gas.

Experts estimate that up to 100,000 barrels of ethane are exported to the United States every day on the Alliance pipeline. That is the equivalent of the feedstock input of a world-scale ethane processing facility.

With 70 per cent of petrochemical operational costs linked to feedstock pricing, stable and certain feedstock supply goes a long way to reducing risk for investors and to shore up Alberta's feedstock competitive advantage.

A THRIVING BUSINESS

Alberta's midstream operators, particularly those with liquids-focused operations, report strong financial results.

For example, Keyera achieved record net earnings of $289.92 million in 2017 compared to $216.85 million in the prior year, mainly due to higher operating margins. Fourth quarter 2017 profit was $88.05 million versus $34.62 million for the comparable period a year earlier.

"Keyera had another successful year in 2017 and it was primarily due to the performance of our core fee-for-service businesses and contributions from our capital projects completed over the last few years," Keyera CEO David Smith said in reviewing the company's results with analysts in early 2018. "Our key financial metrics all increased over the prior year."

The Liquids Infrastructure segment generated record results, with operating margin of $285 million in 2017 compared to $246 million in 2016. These results were driven by increased demand for the company's condensate services, the start of the Norlite take-or-pay contracts and incremental fractionation volumes.

FEEDSTOCK INFRASTRUCTURE PROGRAM

In addition to Alberta's announcement of $500 million in royalty credits for a second round of the Petrochemicals Diversification Program, the province has committed $500 million in loan guarantees and grants to establish a Petrochemical Feedstock Infrastructure Program.

This program would support the expansion of Alberta's petrochemical processing sector by incenting investments in midstream infrastructure to recover natural gas liquids, with a focus on ethane.

Ethane and other components are separated or processed from natural gas in a variety of ways, often at a large-scale processing facility, but it can also occur in smaller facilities located closer to the production site.

Straddle plants extract certain natural gas liquids, including ethane, from major natural gas transmission pipelines and then ship them to other processing or manufacturing plants.

This program will encourage industry to develop more of the facilities needed to capture these important raw ingredients. ■

DOWNSTREAM: PETROCHEMICHALS IN FOCUS

Alberta has the largest petrochemical industry in Canada, characterized by modern, world-scale plants, efficient transportation systems, and access to significant natural gas reserves as well as the third largest crude oil reserve in the world.

These manufacturing facilities turn natural gas liquids into petrochemicals, which are then converted into more valuable products such as plastics, fabrics and electronics.

Alberta has four ethane-cracking plants, including two of the world's largest, with combined annual capacity to produce approximately nine billion pounds of ethylene.

Major Alberta petrochemical producers include Dow Chemical, Nova Chemicals, Shell Chemicals and MEGlobal.

Petrochemical manufacturing is the largest manufacturing sector in Alberta, directly employing more than 7,500 people and exporting $8.2 billion worth of goods each year.

There is enormous potential for investors who are interested in tapping into Alberta's vast energy resources to produce petrochemicals and refined petroleum products.

The cost of operating a petrochemical facility in Alberta compares favourably with competing jurisdictions like the United States and Saudi Arabia. Capital costs, which were significantly higher in Alberta during the past oil boom, have recently been shown to be competitive with projects in the U.S. Gulf Coast, leading global petrochemical companies to take a fresh look at Alberta's opportunity.

There is a highly competitive global investment environment for petrochemicals with governments in competing regions offering substantial incentives in order to attract investment.

Recognizing this, in 2016 the Alberta government launched its Petrochemicals Diversification Program (PDP) to encourage companies to invest in the development of new petrochemical facilities in the province.

In the first round of this initiative, the province awarded $500 million in royalty credits to two project developers.

Inter Pipeline Ltd. will receive up to $200 million in royalty credits to build a propane dehydrogenation (PDH) facility in Strathcona County, part of a $3.5 billion integrated PDH and polypropylene facility. The facility will consume about 22,000 barrels per day. Construction is underway, with the project expected to become operational in late 2021.

Meanwhile, a joint venture of Pembina Pipeline Corporation and Kuwait-based Petrochemical Industries Company (PIC) was awarded up to $300 million in royalty credits for two integrated facilities — a propylene facility and a polypropylene facility — to consume 22,000 barrels per day of propane and be built in Sturgeon County for $3.8 billion to $4.2 billion.

ROUND TWO

Following the recommendations of the Energy Diversification Advisory Committee, in March 2018 the Government of Alberta introduced legislation for a second round of the PDP, including a further $500 million in royalty credits to increase Alberta's competitiveness and develop this value-added industry.

The program would also be expanded to include proposals for ethane, in addition to propane and methane. Ethane is used to create components needed for plastics, detergents, lubricants and other household products. ■

ALBERTA'S PETROCHEMICAL OPPORTUNITIES

Ethane - Alberta already has a world-class ethane-processing cluster that produces ethylene, polyethylene, linear alpha olefins and ethylene glycol. Feedstock supplies can be procured by stripping more ethane from existing natural gas exports and domestic consumption.

A greenfield world-scale ethane cracker and associated derivatives facilities would cost between $8 billion and $12 billion, require 80,000 to 100,000 bbls/d of feedstock, and take seven to nine years to plan, permit and build. Most ethane derivatives demand is in various types of polyethylene, and this demand is expected to grow as much as 5.7 percent annually.

Propane - Alberta has a large surplus of low-cost propane. A greenfield world-scale propane dehydrogenation facility/polymerization unit would cost $3 billion to $5 billion; planning, permitting and construction would take five to six years; and the facility would consume 22,000 bbl/d of propane. Most global propane demand is for the production of polypropylene, and this demand is expected to grow 4.6 per cent annually. Building on Alberta's large supply of propane, the province's Petrochemical Diversification Program capitalizes on the growing global demand for related higher value products and promotes greater energy processing in Alberta. Two projects have been approved under the program's first round.

Methane - A greenfield world-scale methanol plant would cost $900 million to $1.5 billion and consume 0.1 bcf/d of methane. Planning, permitting and construction would take five to six years. Global methanol demand, led by China, is expected to grow at 4.5 per cent a year. Key commercial growth opportunities in the methane space other than methanol include producing electricity, ammonia and urea.

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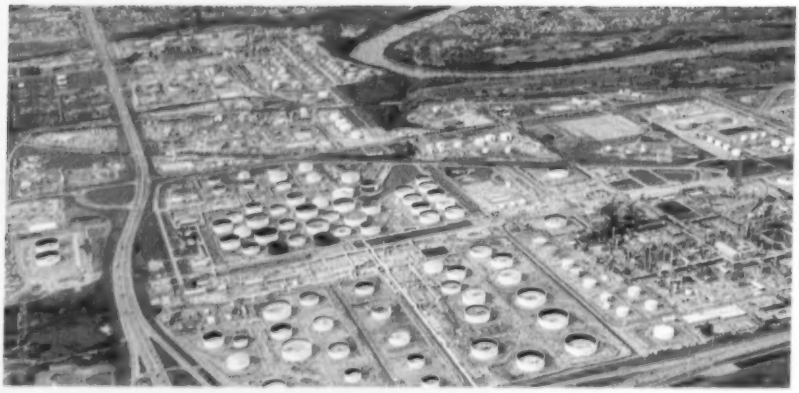
ALBERTA'S INDUSTRIAL HEARTLAND

INVESTMENT LIVES HERE

ALBERTA'S INDUSTRIAL HEARTLAND PRESENTS INCREDIBLE INVESTMENT OPPORTUNITIES AS DEMAND FOR PETROCHEMICALS CONTINUES TO GROW WORLDWIDE



Alberta's Industrial Heartland is Canada's largest hydrocarbon processing center. Our unique region makes us one of the world's most attractive locations for chemical, petrochemical, oil, and gas investment.

The region has world-scale facilities responsible for 43 per cent of our national basic chemical manufacturing industry. The region is ideally located and currently hosts more than 40 companies, many of which are world-scale providing fuels, fertilizers, power, petrochemicals and more to provincial and global consumers.

WORLD CLASS INVESTMENT OPPORTUNITIES

Cost advantaged feedstock is available from globally significant oil and gas reserves. Opportunity exists to capture world class investment opportunities in:

- Petrochemical Production
- Refining
- Manufacturing
- CO2 Capture, Aggregation and Sequestration

PROSPEROUS INVESTMENTS

Within Alberta's Industrial Heartland, the diverse range of feedstock from natural gas, natural gas liquids, bitumen, and refining by-products provide secondary and tertiary derivative manufacturing opportunities.

The potential is great for those interested in accessing these growing volumes to produce refined petroleum products and petrochemicals. Investors benefit from Alberta's extensive oil sands—a secure crude oil source for both domestic and international refineries.

The region also provides easy access to global markets through its efficient transportation infrastructure and is a centre for pipeline terminals. Additionally, investors benefit from pre-zoned heavy industrial lands and strong support for research and development through a thriving business atmosphere strengthened by a recognized export and investment culture.

Investment potential also exists in the area of producing and sharing resources. Deregulated electricty has reduced innovation barriers and enhanced prospects for advancements in co-generation to enable producers to share resources.

Alberta's Industrial Heartland's industrial cluster creates ideal conditions for establishing utility islands and eco-industrial development. The region encompasses over 20 major facilities in a large area, but virtually all interconnected in one way or another.

Sharing resources through business and community cooperation is leading to increased economic gains, improved environmental quality, and enhanced human resources. Tremendous opportunity exists within the region to increase and enhance the eco-industrial concept.

PROJECT DEVELOPMENT

With proven business development capacity and technical sector expertise in petrochemical and hydrocarbon processing, Alberta's Industrial Heartland is client-focused to assist investors in site selection, information gathering, industry and government relations.

The province of Alberta boasts a stable, democratic and business-friendly political system with a favorable tax structure and government alignment and support at all levels. Alberta's Industrial Heartland presents incredible investment opportunities as demand for petrochemicals, fuel, and other refined petroleum products continues to grow worldwide. ■

For more information please contact Garret Matteotti, Director of Business Development, garrett@industrialheartland.com.

A CHAMPION FOR PROPANE BASED PETROCHEMICAL EXPANSION: **SIX QUESTIONS FOR DAVID CHAPPELL**

David Chappell, Senior Vice-President Petrochemical Development, Inter Pipeline

David Chappell is the Senior Vice-President of Petrochemical Development for Alberta-based Inter Pipeline Ltd. In December 2017, Inter Pipeline announced it will move ahead with construction of Canada's first integrated propane dehydrogenation (PDH) and polypropylene (PP) complex. The $3.5 billion Heartland Petrochemical Complex will be located in Strathcona County and, once operational in late 2021, will convert Alberta's abundant supply of propane into high value, easy to transport, and recyclable polypropylene.

We sat down with David in March to get an update on this exciting construction project.

What activities have ramped up, commercially and with construction, since the project has been sanctioned?

We have spent more than $400 million so far to develop the Heartland Petrochemical Complex and we expect to invest approximately $650 million more this year. In 2017, we built surface water runoff and deep underground infrastructure. Now, construction work is underway with the general contract awarded to Kiewit Construction Services.

The site is busy with five pile driving rigs on site, installing up to 50 piles per day with a total goal of nearly 3,000 piles to be driven by summer 2018. We are purchasing equipment and have begun fabrication. We have already signed a number of long-term contracts and plan to secure between 70 and 85 per cent of total petrochemical processing capacity of the complex under take-or-pay contracts by the time the complex begins operations. The plan is for us to utilize the remaining uncontracted plant processing capacity for our own commercial purposes. ➤

Why is Alberta's Industrial Heartland the right place to build this kind of complex?

It's really an ideal location. Strathcona County is in Alberta's Industrial Heartland, an area that is zoned heavy industrial with good access to two railways and other essential industrial infrastructure. The site is within a few kilometers of our Redwater Olefinic Fractionator which processes oil sands upgrader off gas and turns it into propane (among other NGLs).

This represents one potential source of propane feedstock for the Heartland Complex. But the big advantage is the propane feedstock advantage. Over the long-term the Canadian propane market is expected to be oversupplied. Supply is expected to continue to grow as producers drill for liquids rich gas. Alberta propane trades at a discount to Mont Belvieu (Texas) hub, creating a feedstock cost advantage for Alberta-based propane derivatives.

How does a project of this scale support the economy locally and globally?

I'm proud to say that Inter Pipeline has already executed agreements with dozens of local and international suppliers. Hundreds of millions of dollars will be going into the local economy for fabrication and other construction work. About 13,000 direct and indirect construction jobs will be generated by this project over the four-year construction period.

A project of this size also has global reach. One component of the complex is being engineered in Germany and many mechanical components will be imported from other parts of the world. Once operational, there will be approximately 180 permanent jobs at the complex, and approximately 1,000 more indirect local jobs that support the operation of the plant. Markets for polypropylene are mostly international, the U.S. being the largest initially.

Talk a bit about the evolution of the energy industry in Canada.

I believe the Canadian energy industry is evolving. In Canada, we have long been very good at extraction and export of oil and gas. The next step is for Canadian industry to move along the energy value chain and produce valuable products that the world wants and needs. Polypropylene is one great example, but there are more derivatives with great potential. Polypropylene is used in cars to make them lighter (more fuel efficient) and safer (more flexible). Polypropylene is also used in food packaging to keep food safe and contribute to less food waste. Using Alberta's propane for these valuable purposes while generating more jobs and revenues for the province is the next step in our energy story.

Why decide on producing polypropylene?

It came as a natural conclusion as we were already processing and handling propylene and propane. The value increase from propane to propylene was obvious, and research showed the demand for polypropylene growing. Not to mention the fact that it is an easier product to transport. The opportunity to build a large volume, on-purpose propane to polypropylene complex was a logical extension from our existing business in Alberta's Industrial Heartland.

When someone says Heartland Petrochemical Complex out loud, what is your first thought?

I think what a fantastic opportunity for Inter Pipeline, for Alberta and for Canada! ■

ABOUT THE HEARTLAND PETROCHEMICAL COMPLEX

Inter Pipeline is developing Canada's first integrated propane dehydrogenation (PDH) and polypropylene (PP) complex. This $3.5 billion project is designed to consume approximately 22,000 bbls/d of locally sourced, low-cost propane to produce 525 kilotonnes per annum of polypropylene.

PP is a high-value, easy to transport plastic used in the manufacturing of a wide range of finished products, including consumer packaging and containers, textiles, automobile components and Canadian currency.

STRATEGIC RATIONALE

1. Low utility costs and an oversupplied propane market in Western Canada drives a long-term, low-cost feedstock advantage

2. Well-defined project that will utilize globally proven technologies and experienced engineering, procurement and construction firms

3. Integration with existing offgas business creates a competitive advantage; PDH can consume up to 12,000 b/d of high-purity propane produced at Inter Pipeline's Redwater Olefinic Fractionator

4. Strong support from the Government of Alberta; awarded $200 million in royalty credits under Alberta's Petrochemical Diversification Program

5. Over 13,000 direct and indirect jobs are expected to be created for Canadians over the four-year construction period

DEVELOPING RELEVANT AND RESPONSIVE INDUSTRY SOLUTIONS AT **NAIT**

With a vision to be the most relevant and responsive post-secondary institution in Canada and one of the world's leading polytechnics, NAIT is committed to delivering economic and societal benefit for Albertans.

With increasing global competition, businesses in Alberta are focused on improving productivity, diversifying their technological capabilities and addressing the need to be highly innovative. NAIT's commitment is to help our industry partners remain globally competitive, working in partnership to develop relevant and responsive solutions to industry's challenges.

NAIT IS WORKING IN PARTNERSHIP WITH INDUSTRY TO DEVELOP NEW PRODUCTS, TECHNOLOGIES, PROCESSES AND ENGINEERING METHODS DESIGNED TO BUILD ON VALUE-ADDED OPPORTUNITIES.

Alberta, with an abundance of natural resources including oil and natural gas, has the opportunity to develop economic solutions to convert these resources into higher-value products that would integrate with existing facilities, infrastructure and markets. As part of NAIT's proposed Centre for Chemicals and Fuels, Dr. Paolo Mussone, NAIT's Applied Bio/Nanotechnology Industrial Research Chair, is working in partnership with industry to develop new chemical products, technologies, processes and engineering methods designed to build on these value-added industry opportunities, while improving operational efficiencies and reducing waste and carbon emissions.

"NAIT focuses on market-driven, applied research rather than curiosity-driven research," says Mussone, "and by virtue of this we are the first to support an emerging fuel technology platform as a continuum, as a value chain." Dr. Mussone is working with Volvo and Oberon Fuels to test ways to remove water from dimethyl ether (DME) so it can fuel diesel engines without corroding them or reducing their performance. DME is a clean-burning, non-toxic alternative to diesel, produced from methanol which can be made from natural gas.

Dr. Mussone also works closely with NAIT's Centre for Sensors and System Integration, an applied research centre focused on prototyping, product enhancement, testing and characterization services addressing sensor-based challenges in a number of industries, including resource extraction.

Building on NAIT's established strengths and deep relationship with industry, NAIT will be opening its new Productivity and Innovation Centre in the fall of 2018. The 17,650 square metre (190,000 square feet) facility in Edmonton, which received $34.9 million from the Government of Canada's Strategic Investment fund, will provide a range of important industry services, enabling companies of all sizes to become more competitive and sustainable. It will support the development and implementation of new products and processes that address challenges faced by industry and individual companies.

Building on NAIT's strengths, the Productivity and Innovation Centre will provide services in three related areas critical to industry:

- Productivity Enhancement – Increasing NAIT's capacity to help more industry partners to improve productivity, refine and improve manufacturing processes and promote technology adoption.
- Acceleration Services - Building on NAIT's experience in early stage prototyping, product validation and adoption into the manufacturing process.
- Applied Research - The Productivity and Innovation Centre will be the new home for the Centre for Oil Sands Sustainability and the Centre for Sensors and System Integration. It will also provide the additional space needed to create new applied research centres focused on construction, water technologies, distributed energy and effective resource management.

For more information, please contact Deborah Pietrusik - dpietrusik@nait.ca ■

ALIGNING WITH ALBERTA'S **CLIMATE LEADERSHIP PLAN**

The Energy Diversification Advisory Committee (EDAC) has recommended an ambitious plan to at least double Alberta's petrochemical output over the next 20 years as well as hasten the commercialization of partial upgrading technologies that will open up new markets for Alberta's bitumen.

But in doing so, the committee also recognized the delicate balance between growing the sector and staying true to the province's comprehensive Climate Leadership Plan.

"Alberta cannot afford to waste any more time. Critics of industrial development in the downstream oil and gas sector may question whether what EDAC is proposing is consistent with the Alberta government's commitments on the environment and climate change," the committee said in its report, Diversification, Not Decline: Adapting to the new energy reality, released February 26, 2018.

"The Alberta government has explicitly stated that all development must meet the standards set out within the Climate Leadership Plan, the most aggressive climate mitigation policy framework in North America."

Total Alberta GHG emissions were 274 megatonnes (Mt) in 2015 and are projected to increase to 320 Mt by 2030 (a decrease of 50 Mt from the business-as-usual scenario) led by the 1.3 million bbl/d expansion of the oil sands. Therefore, EDAC said expansion of the Alberta downstream energy sector must not significantly increase provincial greenhouse gas (GHG) emissions, or it would work at cross-purposes to the Climate Leadership Plan.

The current Alberta petrochemical industry emits a total of 7.6 Mt a year, just under three per cent of the provincial emissions total.

Under the committee's low liquefied natural gas (LNG) scenario, downstream output would grow by approximately 50 per cent, "which suggests that emissions would grow by the same amount."

Under the high LNG scenario, downstream output would double and presumably emissions would increase by the same proportion.

"Given the large amount of capital that would be invested in downstream energy diversification, the number of jobs created and the provincial tax revenue generated under both scenarios, it could be argued that a modest increase in Alberta GHG emissions is a good example of high carbon productivity, the amount of GDP produced per unit of carbon equivalents emitted," EDAC said.

"Increases in carbon productivity are viewed by economists as an important step toward maintaining economic growth while stabilizing and eventually reducing GHG emissions."

The committee has included carbon productivity as a factor for evaluation of projects seeking support from the Alberta government.

EFFICIENCY IS KEY

According to the EDAC report, a plant constructed today would likely emit 30 per cent less GHG emissions than existing Alberta petrochemical facilities, for four reasons:

- Waste heat can be turned into electricity with co-generation.
- Petrochemical processes consume large amounts of electricity. Switching from coal to natural gas and renewables (wind and solar) reduces the carbon intensity of that power.
- Depending upon the process, carbon dioxide can be captured and used as a feedstock to produce another product, such as methanol.
- More efficient processes that can be better optimized than in the past (using big data and analytics software, for instance).

METHANE EMMISION REDUCTION VITAL

EDAC noted that steps are already being taken under the Climate Leadership Plan to reduce emissions from oil and gas operations in the province by 45 per cent by 2025. These initiatives are being enthusiastically supported by industry.

"With new technologies coming on the market to monitor for leaks and reduce emissions, there is every reason to believe that the entire natural gas supply chain – from wellhead to petrochemical plant – will have a dramatically lower GHG profile in 10 to 15 years than it does today," the committee said in its report.

The committee also took note of the carbon leakage issue.

"To the extent that a new Alberta petrochemical plant displaces one built elsewhere that might have higher GHG emissions, the Alberta operation is a net carbon-benefit to the global carbon budget despite the modest increases that may result in provincial emissions." ■

ROYALTY CREDITS, GRANTS AND LOAN GUARANTEES: **UNDERSTANDING ALBERTA'S DOWNSTREAM INVESTMENT INCENTIVES**

Alberta recognizes that companies considering investment in the province face significant challenges competing for international capital and dealing with regional competitive costs. As a result, Alberta has taken new fiscal steps to incent investment.

In late 2016, the province announced $500 million in royalty credits to encourage development of new petrochemical projects. This was expanded in March 2018 with the introduction of Bill 1: The Energy Diversification Act. If passed, the province will commit:

- $500 million in royalty credits for a second round of the Petrochemicals Diversification Program (PDP), with the figure spread across four years, beginning in 2020-21
- $500 million in loan guarantees and grants to create a Petrochemical Feedstock Infrastructure Program, spread over three years beginning in 2021-22
- $1 billion over eight years for a Partial Upgrading Program, expected to be made up of $800 million in loan guarantees and $200 million in grants, and beginning in 2019-20

Loan guarantees lower the cost of borrowing for companies by underwriting commercial loans for qualified organizations. This encourages targeted investment while also reducing lending risks for financial institutions and potentially lowering interest costs. Grants provide direct funding to support development of qualified projects. This allows government to share costs and lower risks for project proponents, thereby encouraging new investments. More information on the above programs is expected in the coming weeks and months and will be available online from Government of Alberta.

SPOTLIGHT ON ROYALTY CREDITS

Royalty credits reduce the cost of capital for a project proponent.

While petrochemical facilities do not directly benefit from royalty credits as they do not pay royalties, the credits earned can be traded to an oil or natural gas producer. This producer can use these credits to reduce its royalty payments to offset the cost of extracting natural gas and oil.

There is no upfront cost to taxpayers and no credits are awarded to the companies until the petrochemical plants are built and operational.

Example: An approved project under the Petrochemicals Diversification Program can take their propane royalty credits and apply them to any royalty liability account for natural gas, natural gas liquids or bitumen. They can split the credits among several accounts, or enter a private agreement with another company to purchase the royalty credits (the government of Alberta will not be involved in that agreement, nor have knowledge of the details of the transactions).

The approved project will inform Alberta Energy which royalty liability accounts the credits will be applied to, and the value of the credits to be applied.

The petrochemical facility must allocate the Earned Royalty Credits in the same year in which the royalty credits are approved as stated in the program guidelines. This is the mechanism by which Alberta Energy effectively accounts for royalty credits within its royalty systems, and delivers royalty credit benefits under the program.

Recently, Alberta Montney liquids-rich natural gas producer Seven Generations Energy announced it would supply propane to Inter Pipeline's Heartland Petrochemical Complex,

which will receive royalty credits through the first round of the PDP.

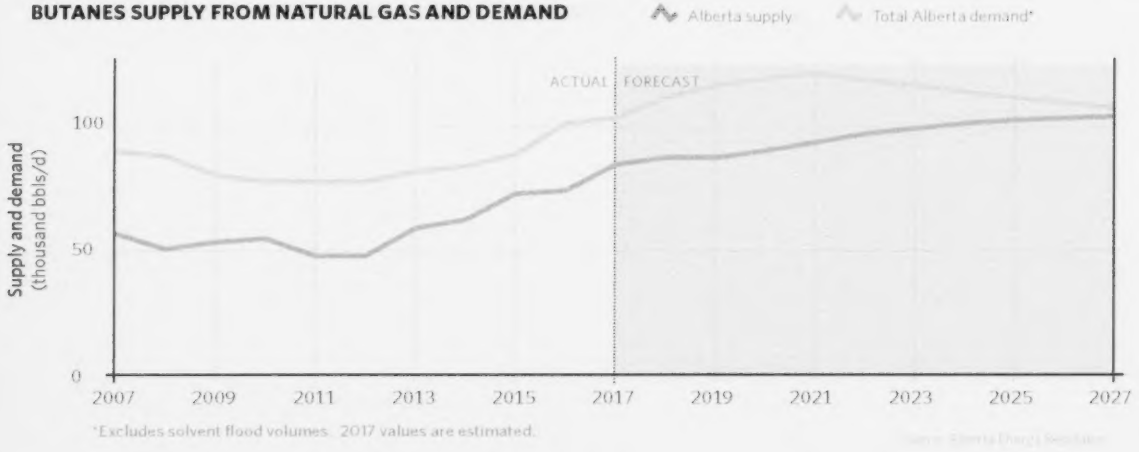
BUILDING ON PAST SUCCESSES

Alberta has experience successfully using a range of tools and incentives to encourage investment in the province:

- The Bitumen Royalty-in-Kind program has supported more refining by allowing the government to take its returns in the form of bitumen rather than cash that can be used for supply or processing agreements, such as in the North West Sturgeon Refinery.
- The Incremental Ethane Extraction Program has encouraged increased supply of ethane for processing in Alberta by providing royalty credits to petrochemical facilities. ■

NATURAL GAS LIQUIDS STATISTICS

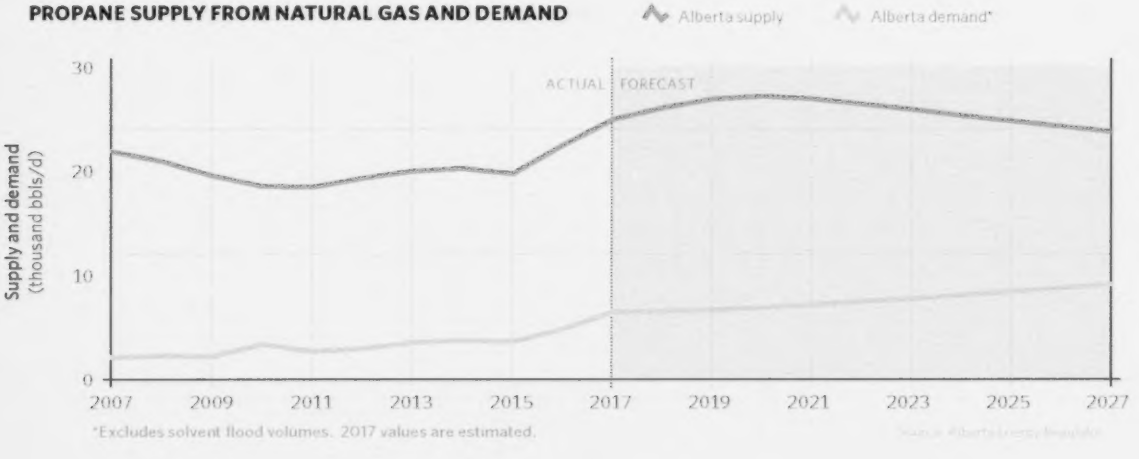
BUTANES SUPPLY FROM NATURAL GAS AND DEMAND



*Excludes solvent flood volumes. 2017 values are estimated.

Source: Alberta Energy Regulator

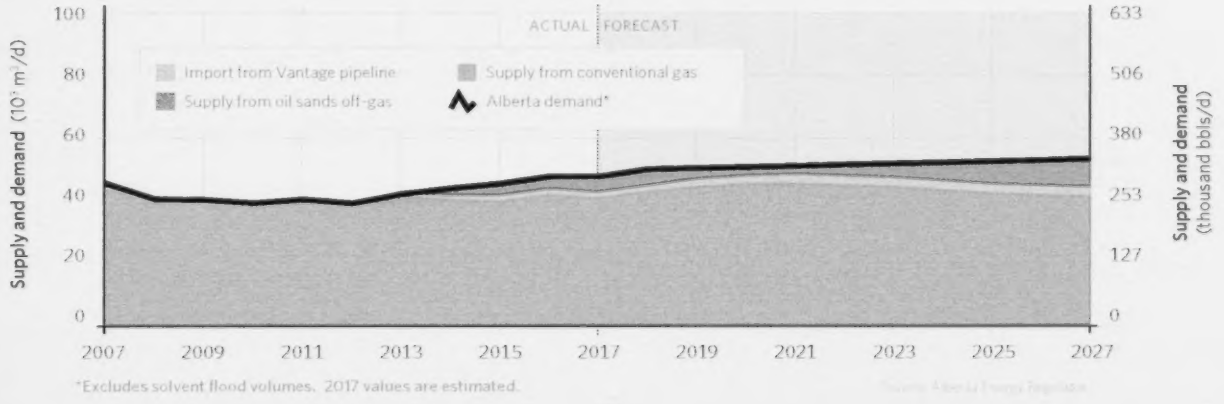
PROPANE SUPPLY FROM NATURAL GAS AND DEMAND



*Excludes solvent flood volumes. 2017 values are estimated.

Source: Alberta Energy Regulator

ETHANE SUPPLY AND DEMAND

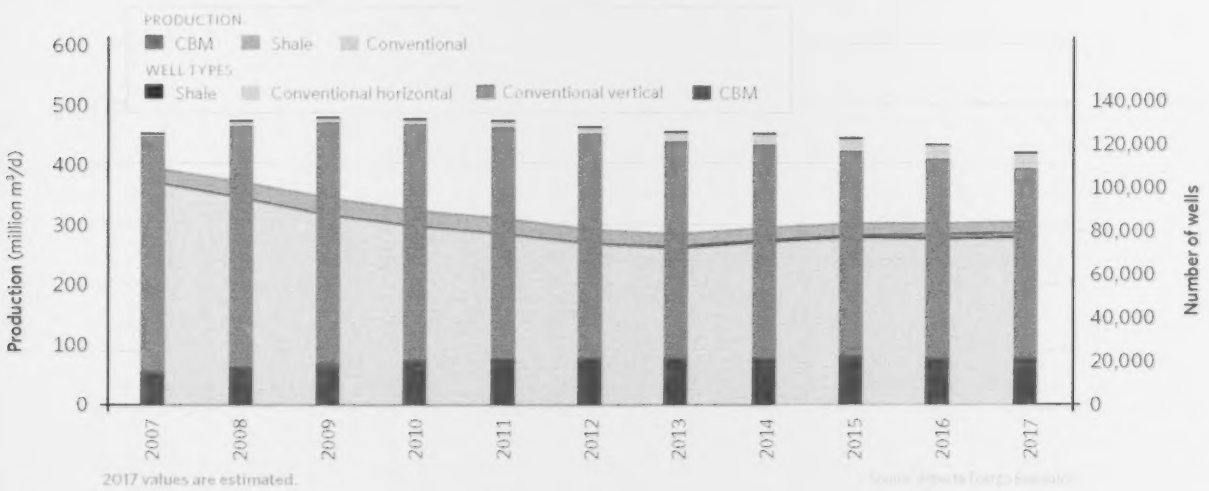


*Excludes solvent flood volumes. 2017 values are estimated.

Source: Alberta Energy Regulator

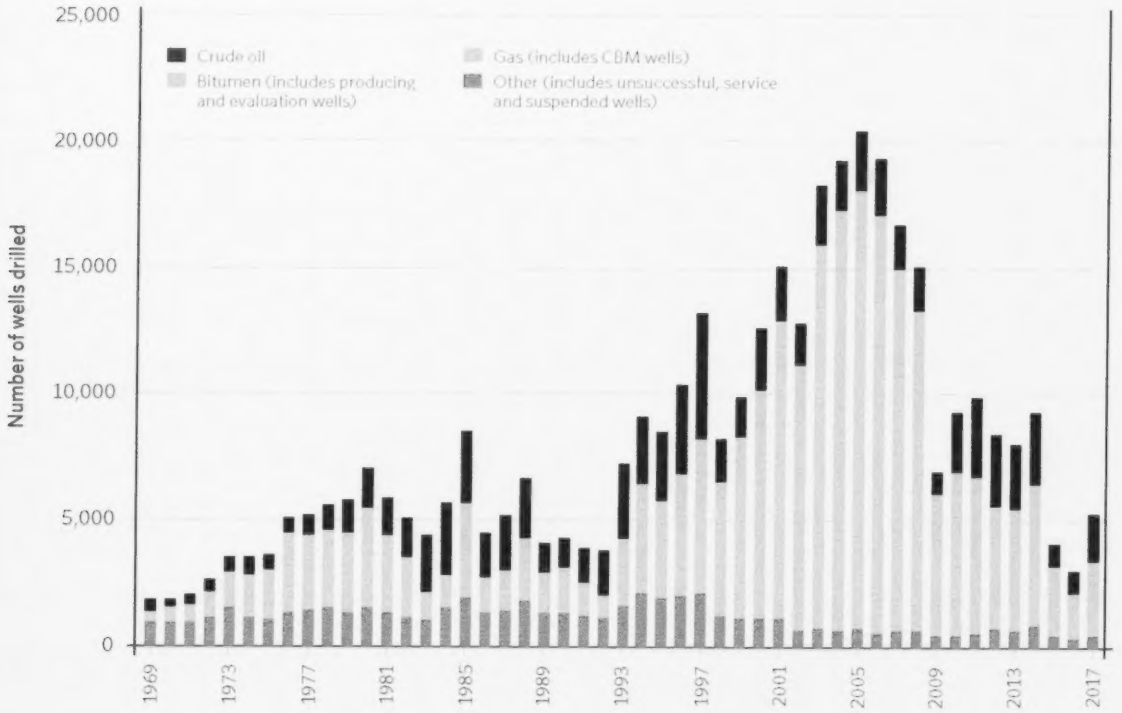
NORTH AMERICAN BENCHMARK NGL PRICES

ALBERTA MARKETABLE GAS AVERAGE DAILY PRODUCTION AND PRODUCING WELLS

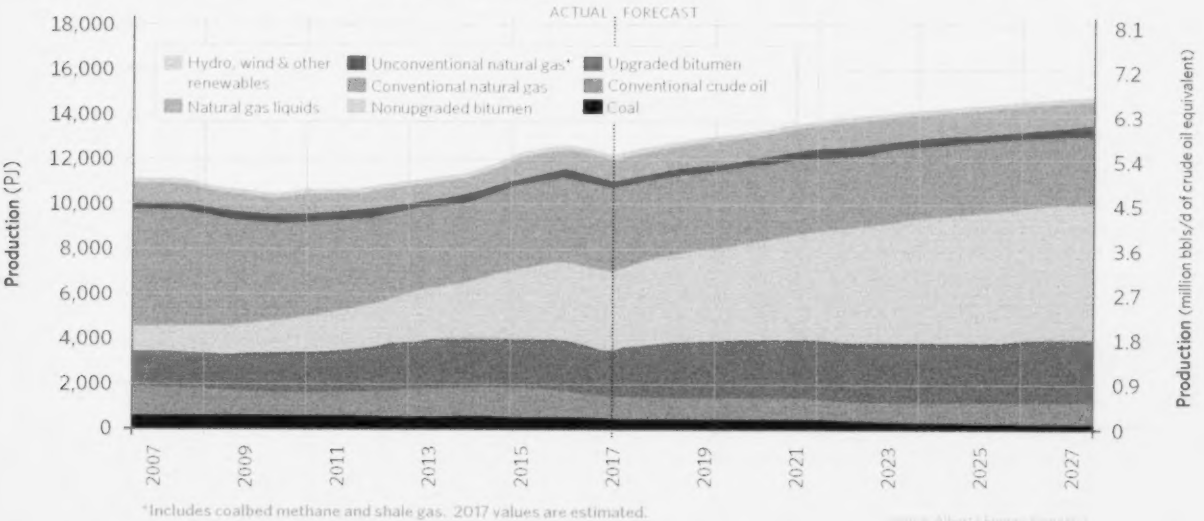


2017 values are estimated.

DRILLING ACTIVITY IN ALBERTA, 1969–2017



TOTAL PRIMARY ENERGY PRODUCTION IN ALBERTA



*Includes coalbed methane and shale gas. 2017 values are estimated.

UPCOMING PETROCHEMICAL EVENTS

CERI BREAKFAST OVERVIEW

The Canadian Energy Research Institute (CERI) will be holding a breakfast overview event for its recent study called Economic Impacts and Market Challenges for the Methane to Derivatives Petrochemical Sub-Sector.

Petrochemical products play a significant role in improving the standard of living in most societies, which is the reason for the rise in both the demand and supply of petrochemical products for many years now.

Asia's burgeoning petrochemical demand growth and feedstock dilemma present an economic opportunity for North America, particularly Canada which has cheap and abundant natural gas feedstock.

This study evaluates the opportunities and challenges associated with the utilization of low cost, abundant Canadian natural gas resources as a petrochemical feedstock for producing methane-derivatives in Alberta and Ontario. The study also considers the competitiveness of these regions compared to the United States Gulf Coast.

Join CERI on April 12 at Bow Valley College in Calgary for breakfast and an overview of study findings. For more information, click here.

STAMPEDE INVESTMENT FORUM

The 6th Annual Stampede Investment Forum, taking place on July 8-11 is an invitation-only event providing delegates with valuable insight on investing in Alberta. Participants will have an opportunity to gain access and meet industry executives and key government officials within Alberta's key industry sectors. This year's program will include the following industry streams: Energy: Oil and Gas and Petrochemicals, Green Economy: Cleantech and Renewables, Agri-business and Health and Life Sciences.

The forum agenda is designed to reflect the interests of the attending delegates, providing the most relevant and current information on sector opportunities to help inform your investment decisions. For more information visit investalberta.ca.

CERI 2018 PETROCHEMICAL CONFERENCE

Canada's petrochemicals industry faces unique challenges at a time when public scrutiny of fossil fuels has never been more intense. How will the industry respond to environmental concerns, manage risks associated with market, political and regulatory uncertainties? How will the Petrochemical Trilemma of social, environmental and economic factors play out for the sector? Delegates will hear from North American subject matter experts who will weigh the opportunities against the risks associated with the development of this sector. The conference will take place June 10 - 12, 2018 in Kananaskis.

GLOBAL PETROLEUM SHOW

The world convenes at Global Petroleum Show (GPS) which connects investors and buyers looking to do business in an ever-changing dynamic energy market. The event takes place June 12-14 at Calgary's Stampede Park.

GPS creates an opportunity for governments, national oil companies, international oil companies, service providers and suppliers spanning the entire value chain from around the globe to build relationships, source new markets and network. GPS is North America's premier sourcing platform for the latest products and solutions for North America's oil and gas industry.

CHEMISTRY CANADA 2018

Attend Canada's leading business focused chemical conference and exhibition.

The chemical industry in North America is experiencing a resurgence. The chemical industry is a diverse group of manufacturing companies that operate in all regions of North America. ChemistryCanada brings together the primary industry players representing chemicals, chemical products, specialty chemicals, petrochemicals, and biochemicals.

The goal of ChemistryCanada is to bring industry operators together with governments, academia and service and supply to meet, share knowledge and forge long term relationships.

ChemistryCanada 2018 will provide insights into how Canada can position itself to be a competitive player on the global chemical stage; as well as offer an expanded technical program and exhibition.

Mark your calendar for September 25-26, 2018 in Edmonton, Alberta. ■

Sixth Annual Stampede Investment Forum

Calgary, Alberta July 8-11, 2018

The Stampede Investment Forum is a unique opportunity for investors to connect with Alberta industry executives and senior government officials during the Calgary Stampede.

For more information about the event and attendee criteria, please visit:

www.StampedeInvestmentForum.com

Alberta Canada | calgary be part of the energy | EDMONTON GLOBAL | Alberta's Industrial Heartland | Western Economic Diversification Canada | Diversification de l'économie de l'Ouest Canada

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